

U.S.S.N. 10/809,974

Claim Amendments

Please amend claims 22-31, 33, 36, and 38-40 as follows:

Please add new claims 41 and 42.

Claims as Amended

22. (currently amended) A gate structure with a reduced Voltage threshold (V_{th}) shift comprising:

a high-K gate dielectric layer disposed over a semiconductor substrate; and,

a buffer dielectric layer on the high-K gate dielectric the buffer dielectric layer comprising dopants selected from the group consisting of a metal, a semiconductor, and nitrogen; and,

a gate electrode layer on the buffer dielectric layer.

23. (currently amended) The gate structure of claim 22 ~~24~~, wherein the wherein the buffer dielectric layer dopant type and dopant level reduces a Voltage threshold (V_{th}) shift compared to

U.S.S.N. 10/809,974

the absence of the doped dielectric buffer layer.

24. (currently amended) The gate structure of claim 22 ~~21~~, wherein buffer dielectric layer dopant type and dopant level reduces Voltage threshold (V_{th}) shift less than about half of the forbidden energy bandgap.

25. (currently amended) The gate structure of claim 22 ~~21~~, further comprising an interfacial layer on the semiconductor substrate.

26. (currently amended) The gate structure of claim 25 ~~21~~, wherein the interfacial layer is selected from the group consisting of silicon dioxide, nitrided silicon dioxide, silicon nitride and silicon oxynitride.

27. (currently amended) The gate structure of claim 22 ~~21~~, wherein the buffer dielectric layer has a dielectric constant of greater than about 3.9.

U.S.S.N. 10/809,974

28. (currently amended) The gate structure of claim 22 ~~21~~, wherein the buffer dielectric layer comprises a non-metal containing dielectric selected from the group consisting of semiconductor-oxide, semiconductor-nitride, oxides, nitrides, and silicates.

29. (currently amended) The gate structure of claim 22 ~~21~~, wherein the buffer dielectric layer comprises a nitrogen doped dielectric selected from the group consisting of silicon nitrides, silicon oxynitrides, silicate nitrides, and silicate oxynitrides.

30. (currently amended) The gate structure of claim 22 ~~21~~, wherein the dopants have a dopant concentration ~~is~~ graded in decreasing concentration from the high-K dielectric layer/buffer dielectric layer interface toward the gate electrode layer.

31. (currently amended) The gate structure of claim 22 ~~21~~, wherein the buffer dielectric layer comprises a dielectric including metal dopants.

U.S.S.N. 10/809,974

32. (original) The gate structure of claim 31, wherein the dielectric is selected from the group consisting of oxides, nitrides, oxynitrides, silicon oxides, silicon nitrides, silicon oxynitrides, silicate nitrides, silicate oxides, and silicate oxynitrides.

33. (currently amended) The gate structure of claim 31, wherein the metal dopants have a concentration is from about 5 atomic percent to about 40 atomic percent.

34. (original) The gate structure of claim 31, wherein the metal dopants are selected from the group consisting of Hf, Al, Ti, Ta, Zr, La, Ce, Bi, W, Y, Ba, Sr, and Pb.

35. (original) The gate structure of claim 31, wherein the metal dopants are selected from the group consisting of Hf and Al.

36. (currently amended) The gate structure of claim 22 ~~21~~,

U.S.S.N. 10/809,974

wherein different metal dopants comprise PMOS and NMOS gate structures.

37. (original) The gate structure of claim 36, wherein Hf comprises the metal dopants in a NMOS gate structure and Al comprises the metal dopants in a PMOS gate structure.

U.S.S.N. 10/809,974

38. (currently amended) The gate structure of claim 22 ~~21~~, wherein the buffer dielectric layer comprises HfO_2 in a NMOS gate structure and Al_2O_3 in a PMOS gate structure.

39. (currently amended) The gate structure of claim 22 ~~21~~, wherein the high-k dielectric layer is selected from the group consisting of metal oxides, metal silicates, metal nitrides, transition metal-oxides, transition metal silicates, metal aluminates, transition metal nitrides, and combinations thereof.

40. (currently amended) The gate structure of claim 22 ~~21~~, wherein the high-k dielectric layer is selected from the group consisting of hafnium oxide, aluminum oxide, titanium oxide, tantalum oxide, zirconium oxide, lanthanum oxide, cerium oxide, bismuth silicate, tungsten oxide, yttrium oxide, lanthanum aluminate, barium strontium titanate, strontium titanate, lead zirconate, PST, PZN, PZT, PMN, and combinations thereof.

41. (new) A gate structure with a reduced Voltage threshold (V_{th}) shift comprising:

U.S.S.N. 10/809,974

a semiconductor substrate;
an interfacial layer on the semiconductor substrate;
a high-K gate dielectric layer on the interfacial layer;
a buffer dielectric layer on the high-K gate dielectric the
buffer dielectric layer comprising dopants selected from the
group consisting of a metal, a semiconductor, and nitrogen; and,
a gate electrode layer on the buffer dielectric layer.

42. (now) A gate structure with a reduced voltage threshold
(V_{th}) shift comprising:

a semiconductor substrate;
a high-K gate dielectric layer on the semiconductor
substrate;
a buffer dielectric layer on the high-K gate dielectric the
buffer dielectric layer comprising dopants selected from the
group consisting of a metal, a semiconductor, and nitrogen; and,
a gate electrode layer on the buffer dielectric layer.